1979 AB2

A $f^n$ is $def^n$ by $f(x) = xe^{-2x}$; $x \in [0,10]$

0

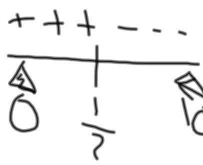
(a) $f$ inc/dec

$f'(x) = (1)(e^{-2x}) + (x)(e^{-2x})(-2)$ +1

$e^{-2x} - 2xe^{-2x}$

$2xe^{-2x} = e^{-2x}$

$x_{zero} = \frac{1}{2}$ (+1)



$\therefore$ inc: $\left[0, \frac{1}{2}\right]$

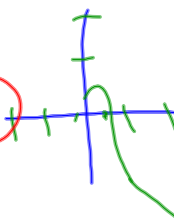
dec: $\left[\frac{1}{2}, 10\right]$

(b) x-coord & y-coord of ALL abs max & min. Justify your answer!

$f'(x) = (1)(e^{-2x}) + (x)(e^{-2x})(-2)$

$y = \left(\frac{1}{2}\right)e^{-2\left(\frac{1}{2}\right)}$

$y = \frac{1}{2}e^{-1}$ $\quad y = \frac{1}{2}\left(\frac{1}{e}\right)$ (+1)



$y = \frac{1}{2e}$ $\quad$ max @ $\left(\frac{1}{2}, \frac{1}{2e}\right)$ +1

$y = (10)e^{-2(10)}$

$y = 10\frac{1}{e^{20}}$ $\quad$ a min @ $\left(10, \frac{10}{e^{20}}\right)$ (+1)

$y = \frac{10}{e^{20}}$

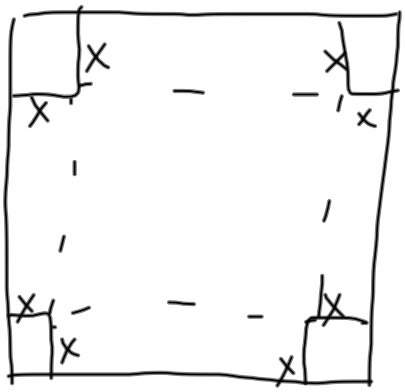
~~(0,0)~~

a min $y = (0)$ $(0,0)$ (+1)

The abs max is at $\left(\frac{1}{2}, \frac{1}{2e}\right)$ because the graph changes from increasing to decr[easing], there is a horizontal tangent, and there is no other critical pt for $f(x)$

+1

The abs [illegible]



1979 AB2

A $f^n$ def$^n$ by $f(x) = xe^{-2x}$ with $x \in [0,10]$.

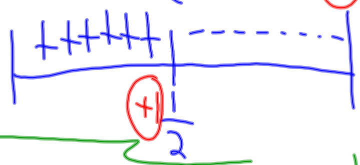
a) Find all $x$ values for which $f$ inc/dec

$f(x) = xe^{-2x}$

$f'(x) = (1)(e^{-2x}) + (x)(-2e^{-2x})$ +1

$e^{-2x} + -2xe^{-2x}$ (+1) INC $[0, \frac{1}{2}]$

$e^{-2x}(1-2x)$ (+1) DEC $[\frac{1}{2}, 10]$



b) x AND y coord of abs max & abs min.

Justify your answer

$f'(x) = e^{-2x} - 2xe^{-2x} = e^{-2x}(1-2x)$

$\left(\frac{1}{2}, \frac{1}{2e}\right)$ = ABS. MAX. +1

Because slope of tangent line changes from positive to negative

$(0, 0)$ = ABS. MIN. +1

$xe^{-2x} = 0e^{-2x} = 0$ +1 = smaller/lower

$xe^{-2x} = 10 \cdot e^{-2 \cdot 10} = \frac{10}{e^{20}}$ +1

(+1) Because there is one critical point and it is a maximum the minimum must be an endpoint.

$f(0) < f(10)$ $\therefore$ $f(0)$ = ABS. MIN

5.5/14) $f(x)=|6-4x|$ ; $[-3,3]$

$$f(x)=\begin{cases} 6-4x \; ; \text{ when } 6-4x \geq 0 \quad 6\geq 4x \quad x\leq \frac{3}{2} \\ -(6-4x) \; ; \text{ when } 6-4x<0 \quad x>\frac{3}{2} \end{cases}$$

$$f'(x)=\begin{cases} -4 \; ; \; x<3/2 \\ +4 \; ; \; x>3/2 \end{cases}$$

deriv $=0$ 

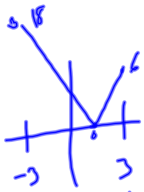
~~NEVER~~

deriv und?

$x=\frac{3}{2}$

$- \; - \; - \; | \; + \; + \; +$

$\frac{3}{2}$




rel min @ $x=\frac{3}{2}$ ; $y=\left|6-4\left(\frac{3}{2}\right)\right|=0$

End pts are $-3, 3$

$f(-3)=|6-4(-3)|=18$

$f(3)=|6-4(3)|=|-6|=6$

$\therefore$ ABS MAX is 18 @ $x=-3$

ABS MIN is 0 @ $x=\frac{3}{2}$

5.5/18

$f(x) = x^4 + 4x \quad ; \; x \in (-\infty, \infty)$

$f'(x) = 4x^3 + 4 = 4(x^3 + 1)$

$= 4(x+1)(x^2 - x + 1)$

QF gives no real roots

f' always defined

$f' = 0 \Rightarrow x = -1$

(-)(+)

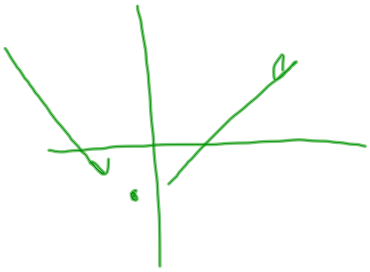
$- - - \quad | \quad + + + +$

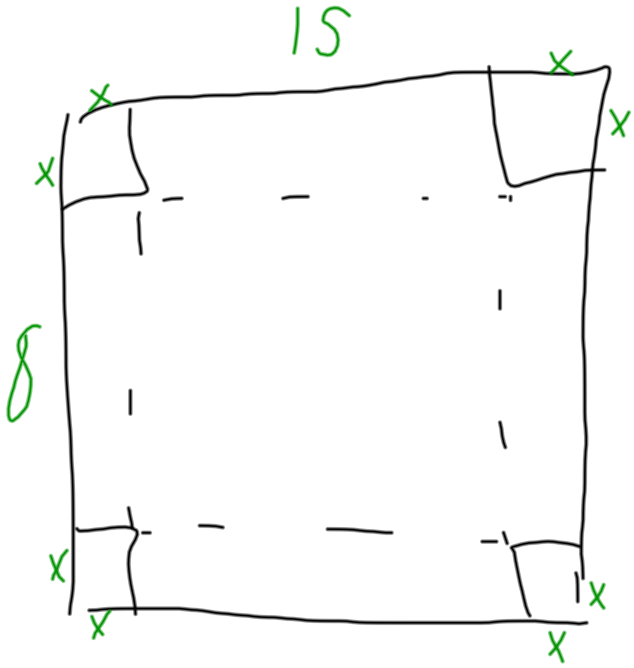
$-10 \qquad -1 \qquad 0$

ABS MIN @ $x = -1$

No ABS MAX

$y = -3$

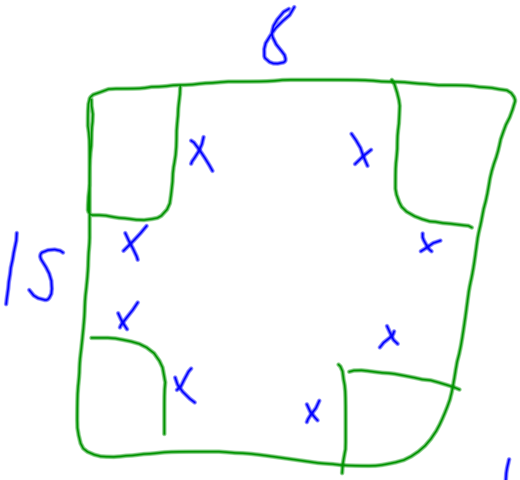



(15 - 2x)

(8 - 2x)

A = H·




$8-2x$

$15-2x$

$$(8-2x)(15-2x)=A$$

$$V=A\cdot H$$

$$V=(8-2x)(15-2x)\cdot x$$